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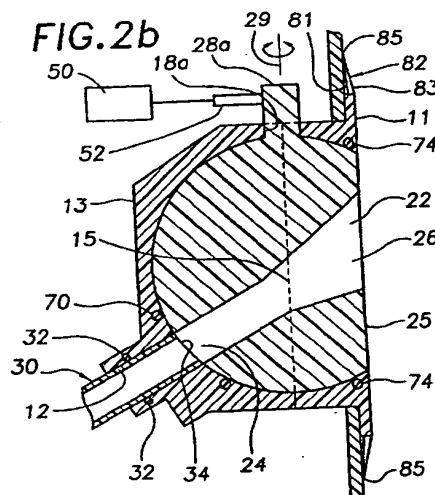
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### (54) Automotive fuel filler pipe ball valve assembly

(57) An automotive fuel filler pipe ball valve assembly (100) mountable in an opening (42) of an automotive body panel (40). The assembly (100) includes a housing member (10) having a ball valve receptacle (16) communicating with a housing inlet opening (12) and a housing outlet opening (14), and a ball valve member (20) having a passage (22) with an inlet opening (24) and an outlet opening (26). The ball valve member (20) includes a stem member (28a) extending through an opening (18a) in the housing member (10), wherein the stem member (28a) is engageable by an actuation member (50) to pivot the ball valve member (20) in the housing member (10), thereby opening and closing the ball valve assembly (100). One or more sealing members (70, 74) form leak-proof seals between the housing member (10) and the ball valve member (20). The assembly is mountable onto the body panel (40) by resilient engagement members (60) breakable to separate the housing member (10) from the automotive body panel (40) during impact.



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## Description

### CROSS REFERENCE TO RELATED APPLICATION

[0001] The present application is related to copending U.S. Application No. 08/991 215 entitled "Automotive Fuel Filler Pipe Housing With Snap-Over Trim Ring" filed contemporaneously and assigned commonly herewith.

### BACKGROUND OF THE INVENTION

[0002] The invention relates generally to automotive refueling systems, and more particularly to automotive fuel filler pipe ball valve assemblies mountable on automotive body panels.

[0003] Removable caps and lids disposed on containers such as automotive fuel filler pipes are known generally. It is known also that removable caps are subject to loss and are sometimes a source of contamination, which is undesirable, particularly in automobile fuel system applications. U.S. Patent No. 5,547,099 entitled "Cover Assembly for Permitting Access Into a Container Without Removal Therefrom" issued 20 August 1996, for example, discloses a spring biased valve device disposed between a base body and a shield, wherein the valve device is pivotal by manipulating an exterior protrusion thereof to open and close an axial bore through the base body without the necessity of a cap or other member removal therefrom.

[0004] The present invention is drawn generally to novel automotive refueling systems, and more particularly novel automotive fuel filler pipe ball valve assemblies.

[0005] It is an object of the invention to provide novel automotive ball valve fuel filler pipe assemblies without spring biased valve devices, and automotive ball valve fuel filler pipe assemblies that do not require a door, yet mimic existing door sporting fuel filler pipe housings.

[0006] It is another object of the invention to provide novel automotive fuel filler pipe assemblies that may be opened and closed without directly contacting the vehicle exterior, and more particularly fuel filler pipe ball valve assemblies that can be opened and closed remotely, for example from within a passenger cabin and or trunk space of the automobile.

[0007] It is another object of the invention to provide novel automotive fuel filler pipe ball valve assemblies that are tamper proof, and more particularly fuel filler pipe ball valve assemblies that are openable by pivoting a shaft member located behind an automotive body panel where it is inaccessible from outside the automobile.

[0008] It is a further object of the invention to provide novel automotive fuel filler pipe ball valve assemblies that meet governmental regulations and industry standards pertaining to automotive fuel systems, and more particularly fuel filler pipe ball valve assemblies that

readily break away from automotive body panels during impact without separating from the fuel filler pipe and without substantial fuel leakage.

[0009] It is yet another object of the invention to provide novel automotive fuel filler pipe ball valve assemblies that are economical, and that may be used with automated refueling systems.

[0010] These and other objects, aspects, features and advantages of the present invention will become more fully apparent upon careful consideration of the following Detailed Description of the Invention and the accompanying Drawings, which may be disproportionate for ease of understanding, wherein like structure and steps are referenced generally by corresponding numerals and indicators.

### BRIEF DESCRIPTION OF THE DRAWINGS

#### [0011]

FIG. 1 is a perspective view of an automotive fuel filler pipe ball valve assembly according to an exemplary embodiment of the invention.

FIG. 2a is a partial sectional view of an automotive fuel filler pipe ball valve assembly in a closed configuration according to an exemplary embodiment of the invention.

FIG. 2b is a partial sectional view of an automotive fuel filler pipe ball valve assembly in an opened configuration according to an exemplary embodiment of the invention.

FIG. 3 is a perspective view of a ball valve member according to an exemplary embodiment of the invention.

FIG. 4 is a perspective view of a ball valve member according to another exemplary embodiment of the invention.

FIG. 5 is an enlarged partial sectional view of a trim ring member of FIG. 2b.

FIG. 6 is a partial sectional view of a portion of the housing member and a trim ring member of an automotive fuel filler pipe housing according to an exemplary embodiment of the invention.

FIG. 7 is an end plan view of a housing member according to another exemplary embodiment of the invention.

FIG. 8 is an end plan view of a trim ring member according to an exemplary embodiment of the invention.

### DETAILED DESCRIPTION OF THE INVENTION

[0012] FIG. 1 is a perspective view of an automotive fuel filler pipe ball valve assembly 100 comprising generally a housing member 10 having a ball valve member 20 disposed pivotally in a ball valve receptacle of the housing member. The housing member 10 is coupled to a fuel filler pipe 30 extending from a fuel tank or fuel cell,

not shown, and the housing member 10 is mountable in an opening of an automotive body panel, wherein the ball valve member 20 is pivotally actuatable in the housing member 10 for opening and closing the fuel filler pipe 30 as discussed further below.

**[0013]** FIGS. 2a and 2b illustrate more particularly the housing member 10 mounted in an automotive body panel 40 opening 42. The housing member 10 includes an inlet opening 12 and an outlet opening 14 communicating with the ball valve receptacle 16 thereof. The inlet opening 12 of the housing member 10 is disposed on a first side 18 thereof disposed on an interior side 44 of the automotive body panel 40, and the outlet opening 14 of the housing member 10 is disposed on a second side 19 thereof so that the outlet opening 14 is accessible from an exterior side 46 of the automotive body panel 40.

**[0014]** The housing member inlet opening 12 is sealingly coupled to the fuel filler pipe 30. In a preferred embodiment, the housing member 10 is a molded plastic material and the fuel filler pipe 30 is insert molded in the inlet 12 thereof. FIG. 2b illustrates a ring type sealing member 32 disposed between the fuel filler pipe 30 and the housing inlet 12, wherein the sealing member 32 may be disposed about the pipe 30 prior to insert molding the pipe in the housing member 10, thereby providing a leak-proof seal therebetween. In another alternative embodiment, a surface portion of the pipe 30 is treated chemically prior to insert molding the pipe 30 in the housing member 10 to promote bonding between the pipe surface and the housing member 10, thereby providing a leak-proof seal therebetween.

**[0015]** FIGS. 1, 2a, 3 and 4 illustrate the ball valve member 20 including a passage 22 with an inlet opening 24 and an outlet opening 26. The ball valve member 20 is pivotal within the ball valve receptacle 16 of the housing member 10 to couple and de-couple the inlet opening 24 of the ball valve member 20 to the inlet opening 12 of the housing member 10, and to couple and de-couple the outlet opening 26 of the ball valve member 20 to the outlet opening 14 of the housing member 20, thereby opening and closing the fuel filler pipe 30.

**[0016]** FIGS. 1, 2a and 2b illustrate the ball valve member 20 having at least one shaft member 28a protruding therefrom, and FIG. 3 illustrates an alternative embodiment of the ball valve member 20 having two shaft members 28a and 28b protruding from opposing sides thereof and along a common axis. The shaft member 28a or members 28a and 28b extend through corresponding shaft openings 18a in the housing member 10 to an outer side thereof. The exemplary embodiments of FIGS. 1, 2a and 2b illustrate only a single shaft opening 18a, but other embodiments may include a second shaft opening through an opposing side of the housing member 10 for accommodating the second shaft member 28b protruding from an opposing side of the ball valve member 20 of the type shown in FIG. 3.

The ball valve member 20 is thus pivotal in the ball valve receptacle 16 of the housing member 10 about an axis 29 through the shaft member 28a or members 28a and 28b.

**[0017]** In the exemplary embodiment, the housing member 10 comprises a first portion 11 and a second portion 13 coupled along a seam 15 extending across the shaft opening 18a, or openings, of the housing member, thereby facilitating assembly of the ball valve member 20 in the housing member 10. The first and second housing portions 11 and 13, or alternatively more portions, may be formed or molded from a fuel resistant plastic material, which portions are adhered together upon assembling the ball valve member 20 in the ball valve receptacle 16 thereof.

**[0018]** FIGS. 2a and 2b illustrate one of the shaft members 28a of the ball valve member 20 engagable from outside the ball valve receptacle 16 of the housing member 10 to pivot the ball valve member 20 about the axis 29 of the shaft member. In the exemplary embodiment, an actuation member 50 is coupled to the shaft member 28a protruding from the ball valve member 20, whereby the actuation member 50 is actuatable remotely to pivot the ball valve member 20 in the ball valve receptacle 16 of the housing member 10. The actuation member 50 may, for example, be an electric servomotor for rotatably driving a worm gear 52 threadably coupled to the shaft member 28a, wherein the actuation member 50 is operable from the passenger cabin of the automobile. The actuation member 50 may alternatively be a manually actuatable mechanical linkage, coupled to a lever arm extending from shaft member 28a, operable from the passenger cabin or trunk space or from outside the automobile. The manually actuatable linkage may be used alone or as auxiliary actuation means in combination with a servomotor actuation member 50. The ball valve member 20 or actuation member 50 may be coupled to one or more sensors, not shown, which detect the position or orientation thereof to provide a sense signal to an on-board processor that controls the automotive electronic ignition system, which may be disabled or enabled depending upon whether the fuel filler pipe is opened or closed.

**[0019]** FIGS. 2a and 2b illustrate the ball valve assembly 100 disposed in the automotive body panel opening 42, wherein the shaft opening 18a of the housing member 20 is disposed on the first side 18 thereof on the interior side 44 of the automotive body panel 40, and the outlet opening 14 of the housing member 10 is accessible from the exterior side 46 of the automotive body panel 40. Locating the shaft member 28a of the ball valve member 20 on the interior side 44 of the body panel 40 and actuating it remotely from within the passenger cabin or trunk space provides a relatively tamper proof fuel system that may be opened and closed without directly contacting the vehicle exterior, which is often dirty and undesirable to handle.

**[0020]** FIGS. 1, 2b, 3 and 4 illustrate the ball valve

member 20 having a first exterior side 25 on which the outlet opening 26 thereof is located. The first exterior side 25 of the ball valve member 20 is thus disposed in the outlet opening 14 of the housing member 10 when the outlet opening 26 thereof is coupled to the outlet opening 14 of the housing member 10. FIGS. 2a and 6 illustrate the ball valve member 20 having a second exterior side 27. The second exterior side 27 of the ball valve member 20 is disposed in the outlet opening 14 of the housing member 10 when the outlet opening 26 thereof is de-coupled from the outlet opening 14 of the housing member 10. The exterior sides 25 and 27 of the ball valve member thus form a portion of the exterior side 46 of the automotive body panel 40, depending upon the orientation or position of the ball valve member 20 in the housing member 10. In a preferred embodiment, at least the second exterior side 27 of the ball valve member 20 is contoured to conform with the exterior side 46 of the automotive body panel 40. The first exterior side 25 of the ball valve member 20 may be concaved to facilitate insertion of a fuel nozzle therein. When the fuel filler pipe is closed, the ball valve assembly 100 provides aerodynamic streamlining and cosmetic contouring continuous with the automotive body panel 40 without the requirement of a door common in prior art fuel filler pipe housing assemblies.

[0021] According to another aspect of the invention, a first sealing member is disposed generally between the ball valve member 20 and the ball valve receptacle 16 of the housing member 10 about the inlet opening 12 thereof, at least when the inlet opening 24 of the ball valve member 20 is coupled to the inlet opening 12 of the housing member 10. FIGS. 2a and 2b illustrate a first ring member 70 disposed and retained in a first recess 72 in the ball valve receptacle 16 of the housing member 10, wherein the first recess 72 is disposed about the inlet opening 12 thereof. FIG. 2b illustrates an alternative embodiment wherein the first sealing member is formed between the ball valve member 20 and the pipe 30 end 34, which may be shaped to correspond with the ball valve member 20 and is in direct contact therewith. In another embodiment, the ring seal member 70 is disposed between the ball valve member 20 and the pipe 30 end 34. Thus the first recess 72 in this alternative embodiment is formed partially by the end 33 of the pipe 30 and partially by the inlet opening 12 of the housing member 10. The first ring member 70 thus forms generally a seal between the ball valve member 20 and the housing member 10 at the inlet 12 thereof when the inlet opening 24 of the ball valve member 20 is coupled to the inlet opening 12 of the housing member 10, and when the ball valve member 20 obstructs the inlet opening 12 of the housing member 10. The first sealing member thereby provides a leak-proof seal between the housing member 10 and the ball valve member 20 when the assembly 100 is opened for refueling as in FIG. 2b and when the assembly 100 is closed as in FIG. 2a.

[0022] According to another aspect of the invention, a second sealing member is disposed between the ball valve member 20 and the ball valve receptacle 16 of the housing member 10 about the outlet opening 14 thereof. FIGS. 2a and 2b illustrate a second ring member 74 disposed and retained in a second recess 76 in the ball valve receptacle 16 of the housing member 10, wherein the second recess 76 is disposed about the outlet opening 14 of the housing member 10. The second ring member 74 thus forms a seal between the ball valve member 20 and the housing member 10 at the outlet 14 thereof when the ball valve assembly 100 is opened and closed, thereby providing a leak-proof seal therebetween. The second sealing member also prevents debris and other potential contaminants from entering the fuel system between the housing member 10 and the ball valve member 20 when the assembly 100 is opened and closed.

[0023] The first and second ring members 70 and 74 may be formed alternatively in corresponding recesses on the ball valve member 20. U.S. Patent No. 5,271,880, entitled "Insert Molding Method For A Seal Member" issued on 21 December 1993 and assigned commonly herewith discloses a method for precisely encapsulating the ring members 70 and 74 in the ball valve member 20 and the housing member 20 during molding operations for the formation thereof.

[0024] FIG. 3 illustrates an alternative embodiment for the first and second sealing members, wherein the first and second ring members are formed by mating surfaces of the ball valve member 20 and the housing member 10. In one embodiment the first and second sealing members are a resilient material 21 disposed over at least a portion of the ball valve member 20. The resilient material is, for example, an elastomeric material molded over at least a portion of the ball valve member 20. FIG. 3 illustrates the elastomeric material disposed over all surfaces of the ball valve member except the first and second exterior sides 25 and 27 and the shaft members 28a and 28b. The thickness of the elastomeric material 21 in FIG. 3 is exaggerated considerably. The ball valve member 20 may be formed by adhering two or more fuel resistant plastic members formable previously in molding operations.

[0025] FIG. 4 illustrates another alternative embodiment wherein the first and second sealing members are a resilient material 31 disposed between rib portions of the ball valve member 20. According to this embodiment, the ball valve member 20 is formed partially preferably in a molding operation, wherein the partially molded ball valve member includes a plurality of rib members 23a and may include a plurality of relatively transverse rib members 23b. The resilient material 31 in this embodiment is, for example, a microcellular elastomeric foam material disposed between the rib members 23a and formed to correspond with the contour of the ball valve member 20. The rib members 23a are preferably aligned to facilitate formation of closed rings by the

resilient material 31 about the inlet and outlet openings 12 and 14 of the housing member 10 when the ball valve member 20 is opened and closed. Portions of rib members 23a and 23b may also be recessed relative to an outer surface of the ball valve member to accommodate the resilient material for this purpose, for example to form a continuous resilient material portion 33 about the first exterior side 25 of the ball valve member 20, which forms a seal between the housing member 10 and the ball valve member 20 about the outlet opening 14.

[0026] FIGS. 6 and 7 illustrate the housing member 10 having one or more breakable resilient engagement members 60 protruding therefrom generally about the outlet opening 14 thereof for mounting the housing member 10 on the automotive body panel 40, and more particularly in the opening 42 thereof. FIG. 7 shows the resilient engagement members 60 disposed about the outlet opening 14 of the housing member 10 and protruding radially from an end portion 17 thereof. Each resilient engagement member 60 includes a stem portion 62 formed by adjacent recesses 63 in the housing member 10, a bevelled edge 64 engageable with the opening 42 of the body panel 40 to flex the stem 62 inwardly, which permits installation of the housing member 10 into the body panel 40 opening, preferably from the interior side 44 thereof. FIG. 7 illustrates an engagement portion 66 of the resilient engagement members 60 seated on the body panel exterior side 46 when the housing member 10 is installed in the opening 42 thereof.

[0027] The resilient members 60 are breakable under predetermined stress and strain conditions to separate the housing member 10 from the automotive body panel 40, thereby ensuring that ball valve assembly 100 remains intact and coupled to the fuel filler pipe 30 during impacts to prevent fuel spillage as required by governmental and industry fuel systems safety regulations and standards. In the exemplary embodiment, at least a portion of the housing member 10 and the plurality of resilient engagement members 60 formed thereon comprise a unitary molded plastic member. The dimensions and number of plastic material resilient members 60 may be designed to break or fail under predetermined stress and strain conditions occurring during impact with accurate predictability, which is necessary to comply with fuel system safety regulations and standards.

[0028] FIGS. 6 and 8 illustrate a trim ring member 80 coupled to the housing member 10. The trim ring member 80 includes a ring member 82, which is annular in the exemplary embodiment, a plurality of curved flange portions 84 and a plurality of resilient tab members 86 protruding from an interior side thereof 81. The curved flange members 84 are disposable in a recess 65, or corresponding recesses, formed in the housing member 10 to align the trim ring member 80 relative thereto. The resilient tab members 86 each include a stem 83 with a bevelled surface 87 engageable with the opening 42 in

the body panel 40 to inwardly flex the resilient tab members 86 as the trim ring member 80 is assembled to the housing member 10, which is previously mounted in the body panel 40 as discussed above. FIG. 6 illustrates the resilient tab members 86 also including a surface portion 88 engageable with the interior side 44 of the body panel 40 to retain the trim ring member 80 in assembly with the housing member 10. The curved flange members 84 of the trim ring member 80 also prevent the resilient engagement members 60 of the housing member 10 from flexing inwardly and disengaging from the body panel 40. FIGS. 6 and 7 illustrate the housing member 10 including recesses 67 on the end portion 17 thereof to accommodate the resilient tab members 86 of the trim ring member 80. FIG. 6 also illustrates the body panel 40 having a recess 43 for accommodating the trim ring 82, which forms a gap therebetween to mimic prior art fuel filler pipe housing assemblies.

[0029] FIGS. 2a, 2b and 5 illustrate the ring member 82 having an interior side 81, an exterior side 83, and an end portion 85. The ring member 82 is coupled to the housing member 10 by a hinge member 90 disposed about outlet opening 14 thereof. The ring member 82 is movable relative to the housing member 10 between a first position where the end portion 85 of the ring member 82 is directed away from the housing member as in FIG. 2a, and a second position where the end portion 85 of the ring member 82 is directed toward the housing member 10 as in FIG. 2b. More particularly, the end portion 85 of the trim member 82 is disposed substantially radially about the housing member 10 in the second position, and the end portion 85 of the trim member 82 is disposed axially beyond the exterior side 19 of the housing member 10 in the first position as discussed more fully in the copending U.S. Application entitled "Automotive Fuel Filler Pipe Housing With Snap-Over Trim Ring" incorporated by reference herein. According to this aspect of the invention, the trim member 82 in the first position is positioned away from the exterior surface 46 of the automotive body panel 40 to permit painting the body panel 40 thereunder during installation of the assembly 100. The trim member 82 is subsequently positionable toward the exterior 46 surface of the automotive body panel 40 in the second position to provide a relatively continuous interface between the housing member 10 and automotive body panel 40. The ring member 82 of FIGS. 2a, 2b and 5 may be formed unitarily with the housing member 10 as shown in FIGS. 2a and 2b, or alternatively and preferably may be coupled to the housing member 10 as illustrated and discussed above in connection with the trim ring member 80 of FIGS. 6-8.

[0030] While the foregoing written description of the invention enables one of ordinary skill in the art to make and use what is at present considered to be the best mode of the invention, it will be appreciated and understood by those of ordinary skill the existence of variations, combinations, modifications and equivalents

within the spirit and scope of the specific exemplary embodiments disclosed herein. The present invention is therefore to be limited not by the specific exemplary embodiments disclosed herein but by all embodiments within the scope of the appended claims.

### Claims

1. An automotive fuel filler pipe ball valve assembly comprising:
    - a housing member having a ball valve receptacle communicating with an inlet opening and an outlet opening, the inlet opening sealingly couplable to a fuel filler pipe;
    - a ball valve member pivotally disposed in the ball valve receptacle of the housing member, the ball valve member having a passage with an inlet opening and an outlet opening, the ball valve member pivotal to couple and decouple the inlet opening of the ball valve member to the inlet opening of the housing member, and to couple and de-couple the outlet opening of the ball valve member to the outlet opening of the housing member;
    - a first sealing member disposed between the ball valve member and the ball valve receptacle of the housing member about the inlet opening of the housing member,
    - whereby the fuel filler pipe ball valve assembly is openable and closable by pivoting the ball valve member in the housing member.
  2. The assembly of Claim 1, the first sealing member is a first ring member disposed and retained in a first recess in the ball valve receptacle of the housing member, the first recess disposed about the inlet opening of the housing member.
  3. The assembly of Claim 1, the first sealing member is a resilient material disposed over at least a portion of the ball valve member.
  4. The assembly of Claim 3, the resilient material is an elastomeric material.
  5. The assembly of as least one of the preceding claims, further comprising a second sealing member disposed between the ball valve member and the ball valve receptacle of the housing member about the outlet opening of the housing member, the ball valve member obstructing the outlet opening of the housing member when the outlet opening of the ball valve member is de-coupled from the outlet opening of the housing member.
  6. The assembly of Claim 5, the second sealing member is a second ring member disposed and retained
- in a second recess in the ball valve receptacle of the housing member, the second recess disposed about the outlet opening of the housing member.
  7. The assembly of Claim 5, the second sealing member is a resilient material disposed over at least a portion of the ball valve member.
  8. An automotive fuel filler pipe ball valve assembly comprising:
    - a housing member having a ball valve receptacle communicating with an inlet opening and an outlet opening;
    - a ball valve member pivotally disposed in the ball valve receptacle of the housing member, the ball valve member having a passage with an inlet opening and an outlet opening, the ball valve member pivotal to couple and decouple the inlet opening of the ball valve member to the inlet opening of the housing member, and to couple and de-couple the outlet opening of the ball valve member to the outlet opening of the housing member;
    - a shaft member protruding from the ball valve member, the shaft member extending from the ball valve receptacle and through a shaft opening in the housing member,
    - whereby the shaft member of the ball valve member is engagable from outside the ball valve receptacle of the housing member to pivot the ball valve member about an axis of the shaft member.
  9. The assembly of Claim 8 further comprising an actuation member coupled to the shaft member protruding from the ball valve member and extending through the shaft opening in the housing member, whereby the actuation member pivots the ball valve member in the ball valve receptacle of the housing member.
  10. The assembly of Claim 8 or 9 a further comprising an automotive body panel with an opening, the automotive body panel having an interior side and an exterior side, the housing member mounted in the opening of the automotive body panel, the shaft opening of the housing member disposed on a first side of the housing member on the interior side of the automotive body panel, the outlet opening of the housing member disposed on a second side of the housing member and accessible from the exterior side of the automotive body panel.
  11. The assembly of at least one of claims 8 to 10, the ball valve member having an exterior side disposable in the outlet opening of the housing member when the outlet opening of the ball valve member is

de-coupled from the outlet opening of the housing member, whereby the exterior side of the ball valve member forms a portion of the exterior side of the automotive body panel.

12. The assembly of at least one of claims 8 to 11, the housing member comprises a first portion and a second portion coupled along a seam across the shaft opening.

13. An automotive fuel filler pipe ball valve assembly mountable in an opening of an automotive body panel, comprising:

a housing member having a ball valve receptacle communicating with a housing inlet opening and a housing outlet opening;

a ball valve member pivotally disposed in the ball valve receptacle of the housing member, the ball valve member having a passage with an inlet opening and an outlet opening,

the ball valve member pivotal to couple and de-couple the inlet opening of the ball valve member to the inlet opening of the housing member, and to couple and de-couple the outlet opening of the ball valve member to the outlet opening of the housing member;

a breakable resilient engagement member protruding from the housing member for mounting the housing member on the automotive body panel,

whereby the breakable resilient member is breakable under predetermined stress and strain conditions to separate the housing member from the automotive body panel.

14. The assembly of Claim 13 further comprising a plurality of breakable resilient engagement members protruding from the housing member and disposed about the outlet opening of the housing member.

15. The assembly of Claim 14, the housing member and the plurality of breakable resilient engagement members are plastic.

16. The assembly of at least one of claims 13 to 15 further comprising a ring member having an end portion, the ring member coupled to the housing member by a hinge member disposed about outlet opening of the housing member, the ring member movable relative to the housing member between a first position where the end portion of the trim member is disposed axially beyond an exterior side of the housing member, and a second position where the end portion of the ring member is disposed substantially radially about the housing member.

17. The assembly of at least one of claims 13 to 16 fur-

ther comprising a trim ring member having a plurality of curved flange portions and a plurality of resilient tab members protruding from an interior side thereof, the curved flange members disposable in a recess formed on an end portion of the housing member, and the resilient tab members engageable with the opening in the automotive body panel retain the trim ring member to the housing member.

18. The assembly of at least one of claims 13 to 17, the ball valve member having an exterior side disposable in the outlet opening of the housing member when the outlet opening of the ball valve member is de-coupled from the outlet opening of the housing member, whereby the exterior side of the ball valve member forms a portion of an exterior side of the automotive body panel.

FIG. 1

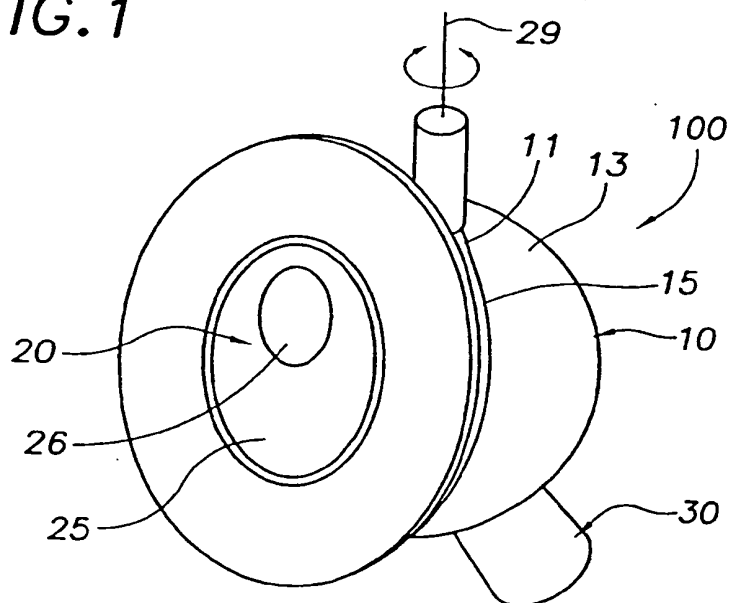


FIG. 3

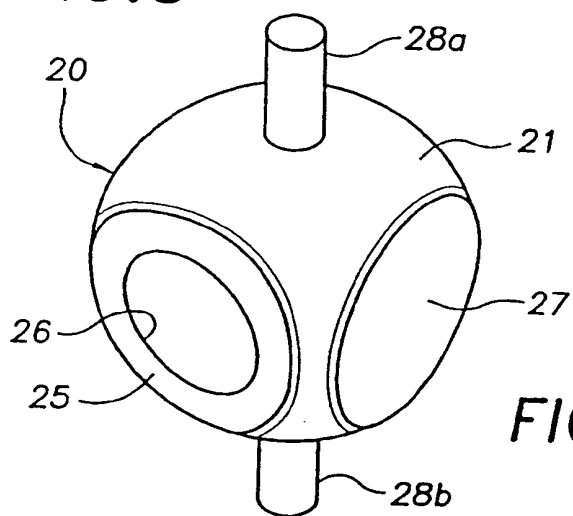


FIG. 4

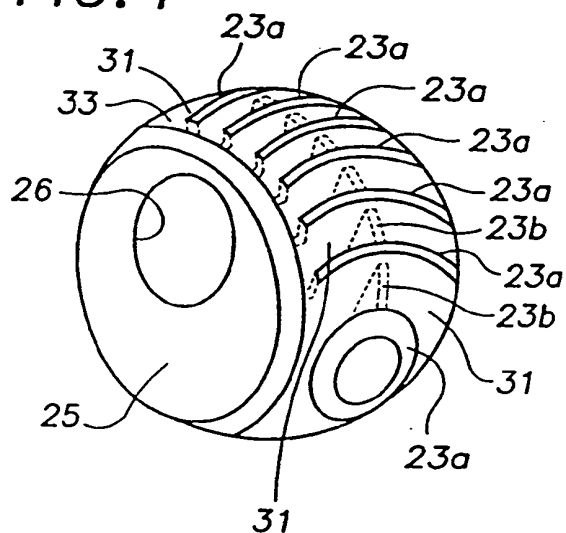




FIG. 2a

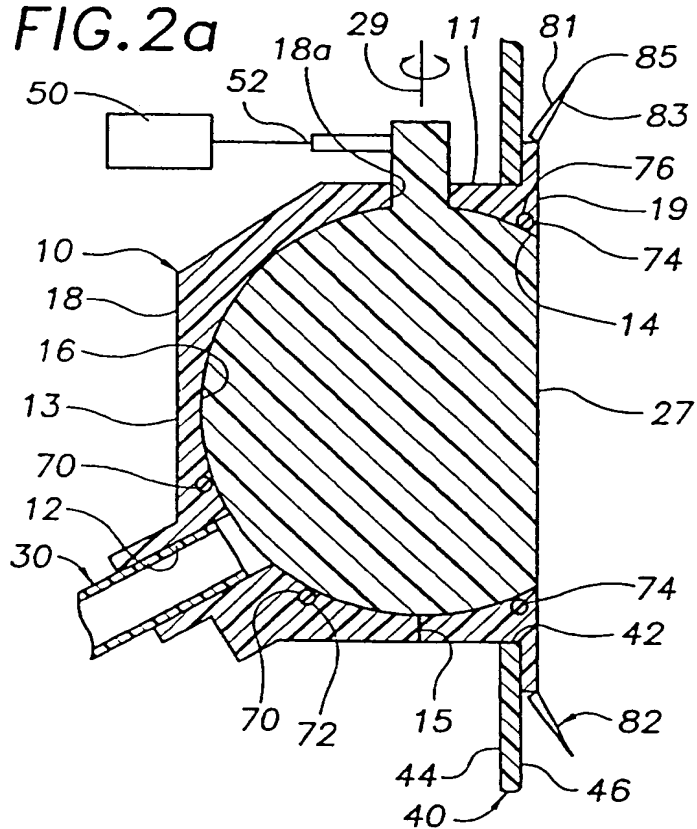


FIG. 2b

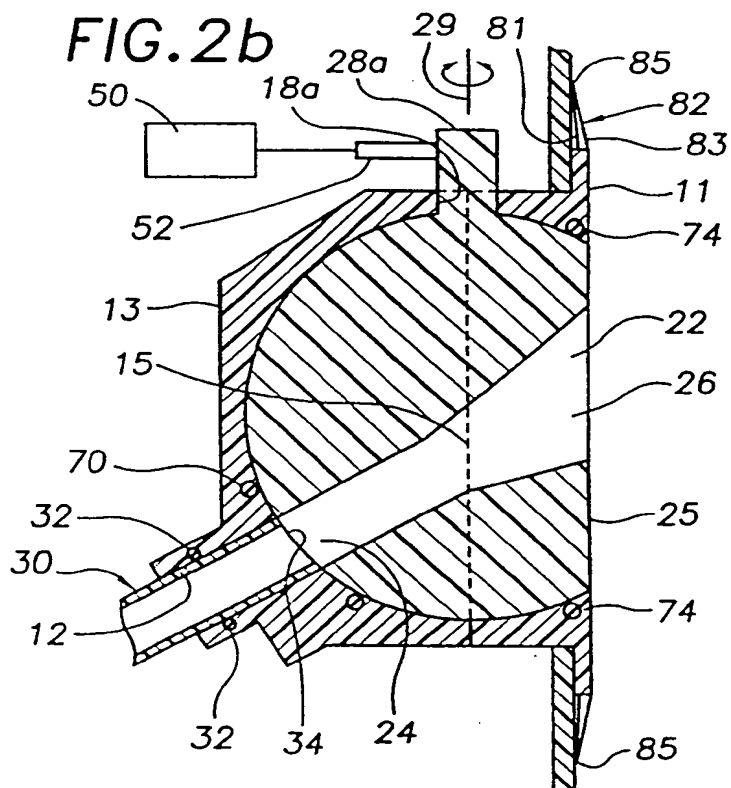


FIG. 5

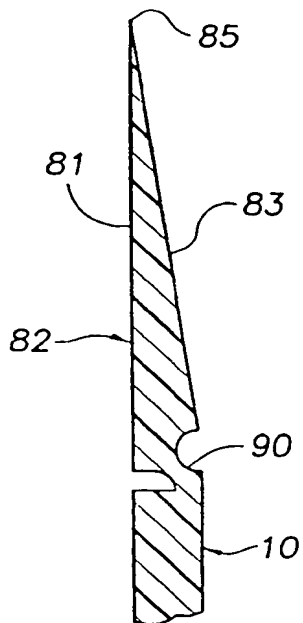


FIG. 6

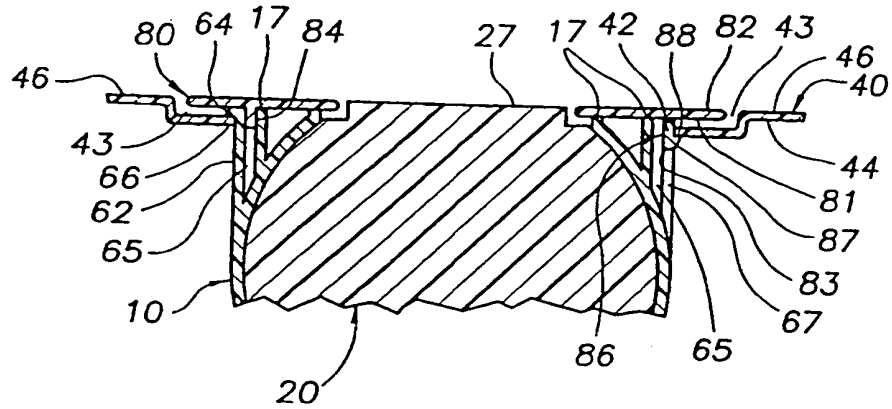


FIG. 7

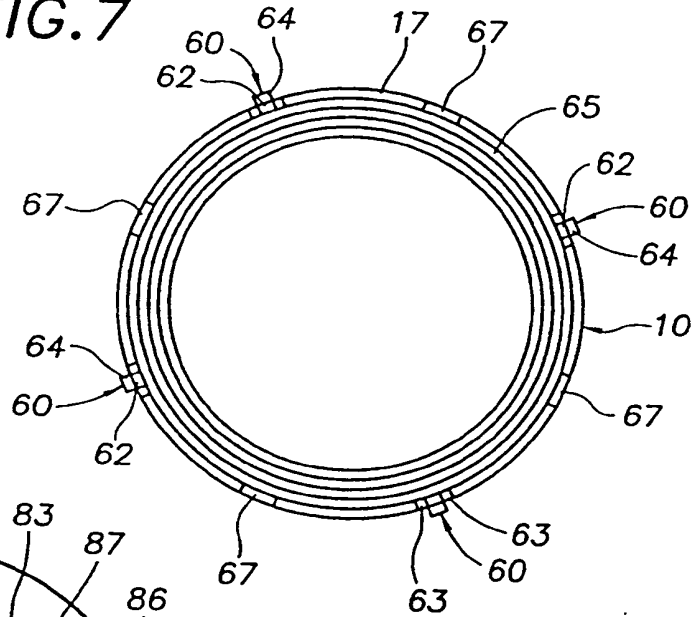
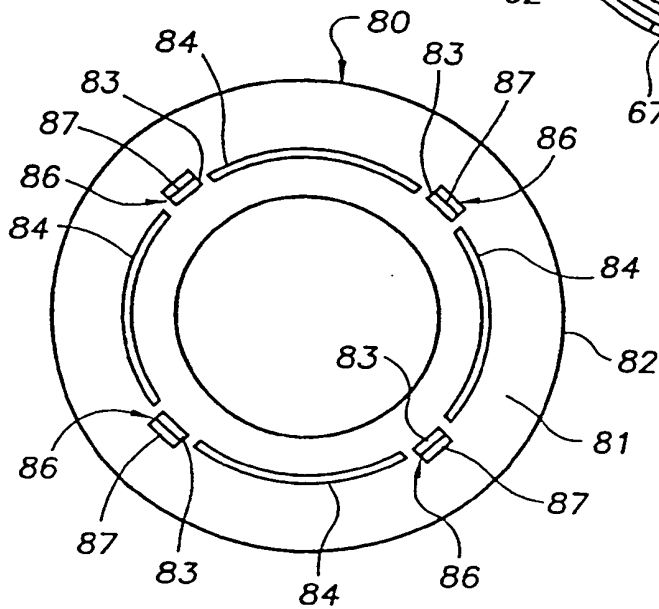


FIG. 8





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 98 12 0737

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.8)
X	FR 2 625 141 A (FIAT AUTO SPA) 30 June 1989	1,2,5-11	B60K15/04
Y	* page 4, line 14 - page 9, line 23; figures 1-8 *	13-15, 17,18	
A	---	3,4	
Y	US 3 856 316 A (BADBERG M) 24 December 1974 * abstract; figures 1,2 * -----	13-15, 17,18	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B60K
Place of search		Date of completion of the search	Examiner
BERLIN		25 March 1999	Wiberg, S
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03 82 (P4/C01)

# ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 98 12 0737

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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25-03-1999

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